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(11) **EP 0 606 180 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**10.06.1998 Bulletin 1998/24**

(51) Int Cl.<sup>6</sup>: **H04N 5/92**

(21) Application number: **94400015.7**

(22) Date of filing: **04.01.1994**

(54) **Apparatus for recording and reproducing digital/analog video signals**

Gerät für die Aufzeichnung und Wiedergabe von digitalen und analogen Videosignalen

Appareil d'enregistrement et de reproduction de signaux vidéo numériques et analogiques

(84) Designated Contracting States:  
**DE FR GB IT NL**

(30) Priority: **05.01.1993 KR 9337**  
**05.02.1993 KR 931576**  
**15.03.1993 KR 933775**  
**19.04.1993 KR 936583**

(43) Date of publication of application:  
**13.07.1994 Bulletin 1994/28**

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**RCA/AC 89127**  
**CITED BY APPLICANT**

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## Description

### BACKGROUND OF THE INVENTION

#### Field of the Invention

The present invention relates to an apparatus for recording and reproducing digital/analog video signals, and more particularly to an apparatus for recording and reproducing digital/analog video signals, capable of achieving record and reproduction of both a digital video signal and an analog video signal, thereby exhibiting a compatibleness with the existing VHS system.

#### Description of the Prior Art

On tapes for VCRs of the VHS system capable of recording NTSC broadcast signals and PAL broadcast signals, analog video signals are recorded. These video signals are recorded with a band of 5MHz in VHF cases and with a band of 7MHz in SVHS cases.

For recording analog video signals with a band of 5 to 7MHz, conventional VCRs include a pair of video heads, an amplifier for record and reproduction of analog video signals, and a signal processing circuit. A relative head drum speed corresponding to a recording wavelength of the video signals is 5.8m/s (1,800rpm in a case of a head drum having a diameter of 62mm).

Where digital video signals are used as receivable signals of high definition televisions (HDTVs), they should be recorded at a higher density than that of analog video signals because of their large data amount (at least 5 times that of analog video signals).

For recording digital video signals with a band of about 15MHz, digital video signal-recordable VCRs include at least one pair of video heads, an amplifier for record and reproduction of digital video signals, and a signal processing circuit. A relative head drum speed corresponding to a recording wavelength of the video signals is 11.6m/s (3,600rpm in a case of a head drum having a diameter of 62mm).

However, conventional VCRs capable of recording analog video signals can not reproduce tapes on which digital video signals are recorded. On the other hand, existing digital VCRs capable of recording digital video signals can not reproduce tapes on which analog video signals are recorded. In other words, conventional VCRs have no compatibleness for digital and analog signals. As a result, there has been a problem that separate VCRs should be provided for record/reproduction of an analog video signal and a digital video signal, respectively.

### SUMMARY OF THE INVENTION

Therefore, an object of the invention is to provide an apparatus for recording and reproducing digital/analog video signals, having a compatibleness capable of

achieving record and reproduction of both a digital video signal and an analog video signal.

Another object of the invention is to provide an apparatus for recording and reproducing digital/analog video signals, capable of recording digital video signals on a tape for record and reproduction of analog video signals, thereby enabling the use of a tape of the existing VHS type or SVHS type as it is.

In accordance with the present invention, this object can be accomplished by providing an apparatus for recording and reproducing digital/analog video signals, comprising: an input switch for selecting one of an analog video signal and a digital video signal inputted in a record mode; a recording unit for processing said video signal selected by a switching operation of said input switch to record the video signal on a tape; head means for recording a video signal on said tape and reproducing said video signal recorded on the tape, said head means having an analog video signal-processing head portion and a digital video signal-processing head portion; switching means for selecting one of said head portions to record the video signal outputted from said recording unit on the tape and reproduce said video signal outputted from the head means; a capstan for rotating a capstan motor in accordance with a selected or detected mode and feeding the tape by the rotation of said capstan motor; an audio/control head for generating a control signal on the basis of the type of video signal recorded on the tape being fed and performing a record mode or a play mode; a head drum rotating by a drum motor to record or reproduce an analog video signal or a digital video signal through said head means during its rotation; a reproducing unit for receiving said video signal from the head means through said switching means and reproducing the received video signal; a comparing unit for controlling an output signal of said reproducing unit with said control signal of said audio/control head to detect whether said output signal of the reproducing unit is an analog video signal or a digital video signal; an output switch for selectively outputting the output signal of the reproducing unit in accordance with a control signal outputted from said comparing unit; and a control unit for outputting control signals for said units of the apparatus in accordance with a selected or detected operation mode.

### BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and aspects of the invention will become apparent from the following description of embodiments with reference to the accompanying drawings in which:

FIG. 1 is a schematic view of a head drum employed in accordance with the present invention;  
FIG. 2 is a block diagram of an apparatus for recording and reproducing digital/analog video signals in accordance with a first embodiment of the present

invention;

FIGS. 3A and 3B are schematic views respectively illustrating patterns of video signals recorded on tapes, in which FIG. 3A is for analog video signals while FIG. 3B is for digital video signals;

FIGS. 4A to 4L are waveform diagrams of various signals outputted from various units of FIG. 2 in a play mode; and

FIG. 5 is a block diagram of an apparatus for recording and reproducing digital/analog video signals in accordance with a second embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 2 is a block diagram of an apparatus for recording and reproducing digital/analog video signals in accordance with a first embodiment of the present invention.

As shown in FIG. 2, the apparatus comprises a switch  $SW_1$  for selecting one of an analog video signal  $SA_1$  and a digital video signal  $SD_1$  inputted in a record mode, a pair of recording unit 1A and 1B for processing the analog video signal  $SA_1$  and the digital video signal  $SD_1$  selected by the switching operation of the switch  $SW_1$ , respectively, two pairs of switches, one pair including two switches  $SW_2$  and  $SW_3$  each adapted to select a corresponding head for recording the analog video signal  $SA_1$  on a tape and the other pair including two switches  $SW_4$  and  $SW_5$  each adapted to select a corresponding head for recording the digital video signal  $SD_1$ , and two pairs of heads, one pair including two heads  $HA_1$  and  $HA_2$  respectively adapted to record the analog video signal  $SA_1$  passing through the switches  $SW_2$  and  $SW_3$  and the other pair including two heads  $HB_1$  and  $HB_2$  respectively adapted to record the digital video signal  $DA_1$  passing through the switches  $SW_4$  and  $SW_5$ . The apparatus further comprises a capstan 2 for rotating a capstan motor  $M_2$  in accordance with a mode selected by the user and feeding the tape by the rotation of the capstan motor  $M_2$ , an audio/control head 3 for outputting a control signal Ctl on the basis of video signals recorded on the tape being fed and performing a record mode or a play mode, a head drum 4 adapted to rotate by a drum motor  $M_1$ , and record or reproduce the analog video signal  $SA_1$  and the digital video signal  $SD_1$  through the heads  $HA_1$ ,  $HA_2$ ,  $HB_1$  and  $HB_2$  during its rotation, a pair of reproducing units 5A and 5B, one adapted to reproduce and process video signals respectively received from the heads  $HA_1$  and  $HA_2$  via the switches  $SW_2$  and  $SW_3$  switched on in the play mode and the other adapted to reproduce and process video signals respectively received from the heads  $HB_1$  and  $HB_2$  via the switches  $SW_4$  and  $SW_5$  switched on in the play mode, a comparing unit for comparing each of output signals from the reproducing unit 5A and 5B with the control signal Ctl from the audio/control head 3 and

checking whether the compared output signal is an analog video signal or a digital video signal, on the basis of the comparison, a switch  $SW_6$  for selecting one of outputs  $SA_0$  and  $SD_0$  of the reproducing units 5A and 5B in accordance with a control signal from the comparing unit 6, and a control unit 7 for outputting control signals for various units of the apparatus.

In FIG. 2, the reference numeral 8 denotes a pinch roller for feeding the tape.

Each of the recording units 1A and 1B comprises a pre-amplifier, a modulator and an equalizer. As shown in FIG. 1, the head drum 3 is attached with the heads  $HA_1$ ,  $HB_1$ ,  $HA_2$  and  $HB_2$  spaced from one another at an angle of  $90^\circ$ . Together with two guide posts 9A and 9B, the head drum 3 serves to maintain the tape at an azimuth angle of at least  $180^\circ$ . To the head drum 3, a phase generator is also attached. Based on a detect signal from the phase generator, switching operations of the switches  $SW_2$  to  $SW_6$  are achieved. The detect signal of the phase generator is also used for the selection of the heads  $HA_1$ ,  $HA_2$ ,  $HB_1$  and  $HB_2$ .

The heads  $HA_1$  and  $HA_2$  are heads arranged at an angle of  $180^\circ$  with respect to each other and adapted to record and reproduce analog signals. Each of heads  $HA_1$  and  $HA_2$  has an azimuth angle of  $\pm 6^\circ$ . On the other hand, the heads  $HB_1$  and  $HB_2$  are heads arranged at an angle of  $180^\circ$  with respect to each other and adapted to record and reproduce digital signals. Each of heads  $HB_1$  and  $HB_2$  has an azimuth angle of  $\pm 15^\circ$  and a phase angle of  $90^\circ$  with respect to the heads  $HA_1$  and  $HA_2$ .

For recording video signals in the recording/reproducing apparatus having the above-mentioned arrangement, the switch  $SW_1$  is switched in accordance with a control signal from the control unit 7 to select one of an analog video signal  $SA_1$  and a digital video signal  $SD_1$ . The selected video signal is then applied to a corresponding one of the recording units 1A and 1B. At this time, the switches  $SW_2$ ,  $SW_3$ ,  $SW_4$  and  $SW_5$  are switched so that their fixed contacts  $a_2$ ,  $a_3$ ,  $a_4$  and  $a_5$  can be connected with their movable contacts  $b_2$ ,  $b_3$ ,  $b_4$  and  $b_5$ , respectively.

When the digital video signal  $SD_1$  is recorded, the switch  $SW_1$  is switched to obtain a connection between its contacts  $a_1$  and  $d_1$ . As a result, the digital video signal  $SD_1$  is fed to the recording unit 1B and then modulated after being amplified to a predetermined level. The modulated video signal denoted by the reference character  $V_2$  is applied from the recording unit 1B to the heads  $HB_1$  and  $HB_2$  for digital signals via the switches  $SW_4$  and  $SW_5$  switched on under a control of the control unit 7.

As the capstan 2 rotates by the capstan motor  $M_2$ , a tape is fed at a speed corresponding to a half of a recording speed  $V_t$  for analog video signals. During the travel of the tape, the modulated video signal  $V_2$  is recorded on the tape, as shown in FIG. 3A. Also, a control signal Ctl B shown in FIG. 4A is recorded on the lower track end 302 of the tape by the audio/control head 3.

As mentioned above, input digital video signals SD<sub>1</sub> are recorded on inclined tracks 303a and 303b having a constant track pitch T<sub>p</sub> and an azimuth angle of  $\pm 15^\circ$ , as shown in FIG. 3A. Control signal Ctl B are recorded on the lower track end 302 of the tape. On the other hand, audio signals are recorded on the upper track end 301 of the tape.

When the analog video signal SA<sub>1</sub> is recorded, the switch SW<sub>1</sub> is switched to obtain a connection between its contacts b<sub>1</sub> and c<sub>1</sub>. As a result, the analog video signal SA<sub>1</sub> is fed to the recording unit 1A which, in turn, modulates the analog video signal SA<sub>1</sub>. The modulated video signal denoted by the reference character V<sub>1</sub> is applied from the recording unit 1A to the heads HA<sub>1</sub> and HA<sub>2</sub> for analog signals via the switches SW<sub>2</sub> and SW<sub>3</sub> switched on under a control of the control unit 7. The modulated video signal V<sub>1</sub> is then recorded on a tape being fed at a normal speed V<sub>t</sub>, as shown in FIG. 3B. Also, a control signal Ctl A shown in FIG. 4B is recorded on the lower track end 306 of the tape.

Input digital video signals SA<sub>1</sub> are recorded on inclined tracks 307a and 307b having a track pitch corresponding to twice the track pitch T<sub>p</sub> of the tracks 303a and 303b and an azimuth angle of  $\pm 6^\circ$ , as shown in FIG. 3B. Control signals Ctl A are recorded on the lower track end 306 of the tape. The recording of control signals Ctl A is accomplished in a manner that the recorded signals can be compatible with the tape patterns of the existing VHS standard.

By the drum driving motor M<sub>1</sub> driven in accordance with the control signal from the control unit 7, the head drum 4 rotates at a rate of 3,600rpm in cases of digital video signals and at a rate of 1,800rpm in cases of analog video signals.

For reproducing video signals recorded in the above-mentioned manner, the switches SW<sub>2</sub>, SW<sub>3</sub>, SW<sub>4</sub> and SW<sub>5</sub> are switched so that their fixed contacts a<sub>2</sub>, a<sub>3</sub>, a<sub>4</sub> and a<sub>5</sub> can be connected with their movable contacts c<sub>2</sub>, c<sub>3</sub>, c<sub>4</sub> and c<sub>5</sub>, respectively. By such switching operations of the switches SW<sub>2</sub>, SW<sub>3</sub>, SW<sub>4</sub> and SW<sub>5</sub>, video signals reproduced by the heads HA<sub>1</sub>, HA<sub>2</sub>, HB<sub>1</sub> and HB<sub>2</sub> are applied to and processed by corresponding reproducing units 5A and 5B, respectively.

At the same time, the audio/control head 3 detects control signals Ctl from the tape being fed. Together with each reproduced video signal, each control signal Ctl is applied to the comparing unit 6. The comparing unit 6 compares the received signals with each other. When the reproduced video signal is a digital video signal, the comparing unit 6 outputs a reference signal Rf B as shown in FIG. 4C. When the reproduced video signal is an analog video signal, the comparing unit 6 outputs a reference signal Rf A as shown in FIG. 4D.

The control unit 7 receives the reference signal which is one of the signals Rf A and Rf B and discriminates whether the reproduced video signal is an analog video signal or a digital video signal. The control unit 7 outputs a control signal corresponding to the discrimi-

nation result. By the control signal from the control unit 7, the switch SW<sub>6</sub> is switched to select one of outputs V<sub>3</sub> and V<sub>4</sub> of the reproducing units 5A and 5B. The SW<sub>2</sub> to SW<sub>5</sub> are also appropriately switched by the control signal from the control unit 7. The drum motor M<sub>1</sub> and the capstan motor M<sub>2</sub> are controlled by the reference signal Rf A or Rf B of the comparing unit 5 to rotate at respective appropriate speeds corresponding to the recorded video signal.

By the control signal from the control unit 7, the phase generator equipped in the head drum 4 is driven to output a detect signal for switching the switches SW<sub>2</sub> to SW<sub>5</sub>. Detect signals for a digital video signal and an analog video signal are shown in FIGS. 4E and 4F, respectively.

As shown in FIG. 4E, the detect signal takes precedence in phase by a predetermined time t<sub>a</sub>, over a digital video signal outputted from the head HB<sub>1</sub>. On the other hand, the detect signal shown in FIG. 4F takes precedence in phase by a predetermined time t<sub>b</sub>, over an analog video signal outputted from the head HA<sub>1</sub>.

As the phase generator outputs the detect signal shown in FIG. 4E, the control unit 7 generates a switching signal HSW as shown in FIG. 4G. By the switching signal HSW, the switches SW<sub>4</sub> and SW<sub>5</sub> are switched respectively to send the digital video signals reproduced in the heads HB<sub>1</sub> and HB<sub>2</sub>, as shown in FIGS. 4H and 4I, to the reproducing unit 5B which, in turn, demodulates the digital video signals. The demodulated digital video signals are outputted from the reproducing unit 5B via the switch SW<sub>6</sub> in which its contacts a<sub>6</sub> and d<sub>6</sub> are connected to each other.

The reproduced digital video signals outputted from the reproducing unit 5B are displayed on a screen as HDTV image signals SD<sub>0</sub>.

As the phase generator outputs the detect signal shown in FIG. 4F, the control unit 7 generates a switching signal 1/2HSW as shown in FIG. 4G. By the switching signal 1/2HSW, the switches SW<sub>2</sub> and SW<sub>3</sub> are switched respectively to send the analog video signals reproduced in the heads HA<sub>1</sub> and HA<sub>2</sub>, as shown in FIGS. 4K and 4L, to the reproducing unit 5A which, in turn, demodulates the analog video signals. The demodulated analog video signals are outputted from the reproducing unit 5A via the switch SW<sub>6</sub> in which its contacts b<sub>6</sub> and c<sub>6</sub> are connected to each other.

The reproduced analog video signals outputted from the reproducing unit 5A are displayed on a screen as NTSC image signals SA<sub>0</sub>.

FIG. 5 is a block diagram of an apparatus for recording and reproducing digital/analog video signals in accordance with a second embodiment of the present invention.

As shown in FIG. 5, the apparatus comprises a switch SW<sub>1</sub>, two pairs of switches, one pair including two switches SW<sub>2</sub> and SW<sub>3</sub> and the other pair including two switches SW<sub>4</sub> and SW<sub>5</sub>, two pairs of heads, one pair including two heads HA<sub>1</sub> and HA<sub>2</sub> and the other pair in-

cluding two heads  $HB_1$  and  $HB_2$ , a capstan motor  $M_2$ , a capstan 2, an audio/control head 3, a head drum 4, a drum motor  $M_1$ , a recording unit 1A, a reproducing unit 5a, a comparing unit 6, a control unit 7, a current control unit 9 for varying the amount of current applied to the recording unit 1A under a control of the control unit 7, and an automatic gain control unit 10 for automatically controlling a gain of a video signal reproduced in the reproducing unit 5A in accordance with a control signal generated from the control unit 7. In accordance with this embodiment, the switch  $SW_1$ , the switches  $SW_2$ ,  $SW_3$ ,  $SW_4$  and  $SW_5$ , the heads  $HA_1$ ,  $HA_2$ ,  $HB_1$  and  $HB_2$ , the capstan motor  $M_2$ , the capstan 2, the audio/control head 3, the head drum 4, the drum motor  $M_1$ , the recording unit 1A, the reproducing unit 5a, the comparing unit 6 and control unit 7 have the same constructions as those in the first embodiment. In accordance with the second embodiment, the recording unit 1B and the reproducing unit 5B used in the apparatus of the first embodiment are omitted.

For recording video signals in the recording/reproducing apparatus having the above-mentioned arrangement, the switch  $SW_1$  is switched in accordance with a control signal from the control unit 7 to select one of an analog video signal  $SA_i$  and a digital video signal  $SD_i$ . The selected video signal is then applied to the recording unit 1A.

At this time, the control signal outputted from the control unit 7 is controlled in current amount by the current control unit 9. The controlled current  $I_1$  is then applied to the recording unit 1A to convert the band and characteristic of the selected video signal received in the recording unit 1A.

In other words, the amount of the current  $I_1$  is varied, depending on the kind of the selected video signal. As a result, the recording unit 1A has a band and a characteristic both varied in accordance with the current  $I_1$  varied in amount. Accordingly, the input video signal is modulated with the varied band and characteristic.

The modulated video signal  $V_1$  is then applied to selected ones of the heads  $HA_1$ ,  $HA_2$ ,  $HB_1$  and  $HB_2$  via selected ones of the switches  $SW_2$ ,  $SW_3$ ,  $SW_4$  and  $SW_5$  to be recorded on a tape being fed. This procedure is the same as that of the first embodiment.

For reproducing video signals recorded in the above-mentioned manner, the switches  $SW_2$ ,  $SW_3$ ,  $SW_4$  and  $SW_5$  are switched so that their fixed contacts  $a_2$ ,  $a_3$ ,  $a_4$  and  $a_5$  can be connected with their movable contacts  $c_2$ ,  $c_3$ ,  $c_4$  and  $c_5$ , respectively. By such switching operations of the switches  $SW_2$ ,  $SW_3$ ,  $SW_4$  and  $SW_5$ , video signals reproduced by the heads  $HA_1$ ,  $HA_2$ ,  $HB_1$  and  $HB_2$  are applied to and processed by the reproducing unit 5A.

At the same time, the audio/control head 3 detects control signals  $Ctl$  from the tape being fed. Together with each reproduced video signal, each control signal  $Ctl$  is applied to the comparing unit 6. The comparing unit 6 compares the received signals with each other. When

the reproduced video signal is a digital video signal, the comparing unit 6 outputs a reference signal  $Rf$  B as shown in FIG. 4C. When the reproduced video signal is an analog video signal, the comparing unit 6 outputs a reference signal  $Rf$  A as shown in FIG. 4D.

The control unit 7 receives the reference signal which is one of the signals  $Rf$  A and  $Rf$  B and discriminates whether the reproduced video signal is an analog video signal or a digital video signal. The control unit 7 outputs a control signal corresponding to the discrimination result. By the control signal from the control unit 7, the video signal reproduced in the reproducing unit 5A is applied to the automatic gain control unit 10 which, in turn, controls the gain of the video signal. The gain of the video signal is varied, based on a corresponding one of a digital video signal band and an analog video signal band.

Thereafter, the video signal varied in gain is demodulated and then outputted. This procedure is the same as that of the first embodiment.

Although two pairs of heads are used for an analog video signal and a digital video signal, respectively, only one pair of heads may be used for both the analog video signal and the digital video signal by varying the amount of current applied to the heads.

As apparent from the above description, the present invention provides an apparatus for recording and reproducing digital/analog video signals, capable of achieving record and reproduction of both a digital video signal and an analog video signal by use of one head drum. Accordingly, it is possible to reproduce tapes of the existing analog type and yet maintain the function of high definition digital VCRs.

In accordance with the present invention, both the analog signal and the digital signal can be recorded and reproduced by a single recording unit and a single reproducing unit both capable of varying in characteristic, based on a video signal received thereto. This provides a reduction in manufacture cost and a light, thin, simple and compact construction of the existing VCRs.

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

## Claims

1. An apparatus for recording and reproducing digital/analog video signals, comprising:

an input switch for selecting one of an analog video signal and a digital video signal inputted in a record mode;  
a recording unit for processing said video signal selected by a switching operation of said input

switch to record the video signal on a tape;  
head means for recording a video signal on said tape and reproducing said video signal recorded on the tape, said head means having an analog video signal-processing head portion and a digital video signal-processing head portion; switching means for selecting one of said head portions to record the video signal outputted from said recording unit on the tape and reproduce said video signal outputted from the head means;

a capstan for rotating a capstan motor in accordance with a selected or detected mode and feeding the tape by the rotation of said capstan motor;

an audio/control head for generating a control signal on the basis of the type of video signal recorded on the tape being fed and performing a record mode or a play mode;

a head drum rotating by a drum motor to record or reproduce an analog video signal or a digital video signal through said head means during its rotation;

a reproducing unit for receiving said video signal from the head means through said switching means and reproducing the received video signal;

a comparing unit for controlling an output signal of said reproducing unit with said control signal of said audio/control head to detect whether said output signal of the reproducing unit is an analog video signal or a digital video signal;

an output switch for selectively outputting the output signal of the reproducing unit in accordance with a control signal outputted from said comparing unit; and

a control unit for outputting control signals for said units of the apparatus in accordance with a selected or detected operation mode.

2. An apparatus in accordance with claim 1, wherein each of said input switch and said output switch has two switching positions respectively corresponding to said analog video signal and said digital video signal.

3. An apparatus in accordance with claim 1, said switch means has four switching positions respectively for connecting an output of said recording unit to said digital signal-processing head portion of said head means in the record mode, for connecting said output of the recording unit to said analog signal-processing head portion of the head means in the record mode, for connecting the digital signal-processing head portion of the head means to said reproducing unit in the reproducing mode, and for connecting the analog signal-processing head portion of the head means to the reproducing unit in

the reproducing mode.

4. An apparatus in accordance with claim 1, wherein said head means comprises four heads attached to said head drum and spaced from one another at an angle of 90° to define a phase angle of 90° between adjacent heads, two facing ones of said heads constituting said analog signal-processing head portion and the other two facing heads constituting said digital signal-processing head portion.

5. An apparatus in accordance with claim 1, further comprising:

a current control unit for varying an amount of current applied to said recording unit under a control of said control unit; and  
an automatic gain control unit for automatically controlling a gain of said video signal reproduced in said reproducing unit under a control of the control unit.

6. An apparatus in accordance with claim 1, wherein said head means comprises a single head constituting both said analog video signal-processing head portion and said digital video signal-processing head portion, and means for varying an amount of current to be applied to said head means such that the analog video signal-processing head portion and the digital video signal-processing head portion receive different amounts of current.

#### Patentansprüche

1. Vorrichtung zur Aufzeichnung und Wiedergabe von digitalen/ analogen Videosignalen mit einem Eingangsschalter zur Auswahl eines aus einem analogen Videosignal und einem digitalen Videosignal, das im Aufnahmehodus eingegeben worden ist, mit einer Aufnahmeeinheit zur Verarbeitung dieses Videosignales, welches durch die Schaltoperation von dem Eingangsschalter ausgewählt worden ist, um das Videosignal auf einem Band aufzuzeichnen, mit Kopfmitteln zur Aufzeichnung eines Videosignales auf das Band und zur Wiedergabe dieses auf das Band aufgezeichneten Videosignales, wobei die Kopfmittel einen Analogvideosignal-Verarbeitungsbereich und einen Digitalvideosignal-Verarbeitungsbereich aufweisen, mit Schaltmitteln zur Auswahl eines dieser Kopfbereiche zur Aufzeichnung des aus der Aufzeichnungseinheit ausgegebenen Videosignales auf das Band und zur Wiedergabe des aus den Kopfmitteln ausgegebenen Videosignales, mit einer Bandantriebsachse zum Drehen eines Bandantriebsmotors in Übereinstimmung mit einem ausgewählten oder erkannten Modus und zum Zuführen des Bandes durch Drehung

- des Bandantriebsmotors, mit einem Audio-/Steuerkopf zur Erzeugung eines Steuersignales auf der Basis der Art des auf dem zugeführten Band aufgenommenen Videosignales und zur Ausführung eines Aufnahme- oder Abspielmodus, mit einer Kopfwalze, die sich durch einen Walzenmotor dreht, um ein analoges Videosignal oder ein digitales Videosignal durch die Kopfmittel während seiner Drehung aufzuzeichnen oder wiederzugeben, mit einer Wiedergabeeinheit zum Empfangen dieses Videosignales aus den Kopfmitteln durch die Schaltermittel und zur Wiedergabe des empfangenen Videosignales, mit Vergleichsmitteln zur Steuerung eines Ausgangssignales der Wiedergabeeinheit, wobei das Steuersignal des Audio-Steuerkopfes zur Bestimmung dient, ob das Ausgangssignal der Wiedergabeeinheit ein analoges Videosignal oder ein digitales Videosignal ist, mit einem Ausgangsschalter zur selektiven Ausgabe des Ausgangssignales der Wiedergabeeinheit in Übereinstimmung mit dem Steuersignal, das aus der Vergleichseinheit ausgegeben wird, und mit einer Steuereinheit zur Ausgabe von Steuersignalen für die Einheiten der Vorrichtung in Übereinstimmung mit einem ausgewählten oder bestimmten Arbeitsmodus.
2. Vorrichtung nach Anspruch 1, wobei sowohl der Eingangsschalter als auch der Ausgangsschalter jeweils zwei Schaltpositionen aufweist, die jeweils dem analogen Videosignal und dem digitalen Videosignal entsprechen.
  3. Vorrichtung nach Anspruch 1, wobei die Schaltermittel vier Schaltpositionen jeweils zum Verbinden eines Ausgangs der Aufnahmeeinheit mit dem Digitalsignal-Verarbeitungskopfbereich der Kopfmittel im Aufnahmestand, zum Verbinden des Ausgangs der Aufnahmeeinheit mit dem Analogsignal-Verarbeitungsbereich der Kopfmittel im Aufnahmestand, zum Verbinden des Digitalsignal-Verarbeitungskopfbereiches der Kopfmittel mit der Wiedergabeeinheit im Wiedergabemodus und zum Verbinden des Analogsignal-Verarbeitungskopfbereiches der Kopfmittel mit der Wiedergabeeinheit im Wiedergabezustand aufweisen.
  4. Vorrichtung nach Anspruch 1, wobei die Kopfmittel vier Köpfe aufweisen, die an der Kopfwalze befestigt sind und beabstandet voneinander in einem Winkel von 90° angeordnet sind, um einen Phasenwinkel von 90° zwischen benachbarten Köpfen zu begrenzen, wobei zwei gegenüberliegende der Köpfe den Analogsignal-Verarbeitungskopfbereich und die anderen gegenüberliegenden zwei Köpfe den Digitalsignal-Verarbeitungskopfbereich bilden.
  5. Vorrichtung nach Anspruch 1, zusätzlich mit einer Stromsteuereinheit zur Veränderung der Strom-

stärke, die auf die Aufnahmeeinheit unter Steuerung der Steuereinheit angewendet wird, und mit einer automatischen Verstärkungssteuereinheit zum automatischen Steuern einer Verstärkung des Videosignales, das in der Wiedergabeeinheit unter einer Steuerung der Steuereinheit wiedergegeben wird.

6. Vorrichtung nach Anspruch 1, wobei die Kopfmittel einen Einzelkopf, der sowohl den Analogvideosignal-Verarbeitungskopfbereich als auch den Digitalvideosignal-Verarbeitungskopfbereich bildet, und Mittel zum Verändern der Stromstärke aufweisen, die auf die Kopfmittel angewendet wird, derart, daß der Analogvideosignal-Verarbeitungskopfbereich und der Digitalvideosignal-Verarbeitungskopfbereich verschiedene Stromstärken empfangen.

## Revendications

1. Un appareil pour enregistrer et reproduire des signaux vidéo numériques/analogiques, comprenant :

un commutateur d'entrée pour sélectionner un signal parmi un signal vidéo analogique et un signal vidéo numérique qui sont introduits dans un mode d'enregistrement;

une unité d'enregistrement pour traiter le signal vidéo qui est sélectionné par une opération de commutation du commutateur d'entrée, pour enregistrer le signal vidéo sur une bande;

une structure de têtes pour enregistrer un signal vidéo sur la bande et reproduire le signal vidéo qui est enregistré sur la bande, cette structure de têtes comprenant une section de têtes de traitement de signal vidéo analogique et une section de têtes de traitement de signal vidéo numérique;

des moyens de commutation pour sélectionner l'une des sections de têtes, pour enregistrer sur la bande le signal vidéo qui est émis par l'unité d'enregistrement, et pour reproduire le signal vidéo qui est émis par la structure de têtes;

un cabestan pour faire tourner un moteur de cabestan conformément à un mode sélectionné ou détecté, et pour transporter la bande sous l'effet de la rotation du moteur de cabestan;

une tête de commande/audio pour générer un signal de commande sur la base du type du signal vidéo qui est enregistré sur la bande qui est transportée, et pour travailler dans un mode d'enregistrement ou un mode de reproduction;

un tambour de têtes qui est mis en rotation par un moteur de tambour pour enregistrer ou reproduire un signal vidéo analogique ou un signal vidéo numérique, par l'intermédiaire de la

- structure de têtes, pendant sa rotation;  
 une unité de reproduction pour recevoir le signal vidéo provenant de la structure de têtes, par l'intermédiaire des moyens de commutation, et pour reproduire le signal vidéo reçu; 5  
 une unité de comparaison pour commander un signal de sortie de l'unité de reproduction avec le signal de commande de la tête de commande/audio, afin de détecter si le signal de sortie de l'unité de reproduction est un signal vidéo analogique ou un signal vidéo numérique; 10  
 un commutateur de sortie pour émettre sélectivement le signal de sortie de l'unité de reproduction, conformément à un signal de commande qui est émis par l'unité de comparaison; 15  
 et  
 une unité de commande pour émettre des signaux de commande pour les unités de l'appareil, conformément à un mode de fonctionnement sélectionné ou détecté. 20
2. Un appareil selon la revendication 1, dans lequel chaque commutateur parmi le commutateur d'entrée et le commutateur de sortie a deux positions de commutation correspondant respectivement au signal vidéo analogique et au signal vidéo numérique. 25
3. Un appareil selon la revendication 1, dans lequel les moyens de commutation ont quatre positions de commutation, respectivement pour connecter une sortie de l'unité d'enregistrement à la section de têtes de traitement de signal numérique de la structure de têtes dans le mode d'enregistrement, pour connecter la sortie de l'unité d'enregistrement à la section de têtes de traitement de signal analogique de la structure de têtes dans le mode d'enregistrement, pour connecter la section de têtes de traitement de signal numérique de la structure de têtes à l'unité de reproduction dans le mode de reproduction, et pour connecter la section de têtes de traitement de signal analogique de la structure de têtes à l'unité de reproduction dans le mode de reproduction. 30  
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4. Un appareil selon la revendication 1, dans lequel la structure de têtes comprend quatre têtes qui sont fixées sur le tambour de têtes et sont écartées les unes des autres d'un angle de 90°, pour définir un angle de phase de 90° entre des têtes adjacentes, deux de ces têtes qui sont placées face à face constituant la section de têtes de traitement de signal analogique et les deux autres têtes placées face à face constituant la section de têtes de traitement de signal numérique. 50  
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5. Un appareil selon la revendication 1, comprenant en outre :
- une unité de commande de courant pour faire varier une valeur du courant qui est appliqué à l'unité d'enregistrement, sous la commande de l'unité de commande; et  
 une unité de commande automatique de gain pour commander automatiquement un gain du signal vidéo qui est reproduit dans l'unité de reproduction, sous la commande de l'unité de commande.
6. Un appareil selon la revendication 1, dans lequel la structure de têtes comprend une seule tête constituant à la fois la section de têtes de traitement de signal vidéo analogique et la section de têtes de traitement de signal vidéo numérique, et des moyens pour faire varier une valeur du courant qui est appliqué à la structure de têtes, de façon que la section de têtes de traitement de signal vidéo analogique et la section de têtes de traitement de signal vidéo numérique reçoivent des valeurs de courant différentes.



FIG.1

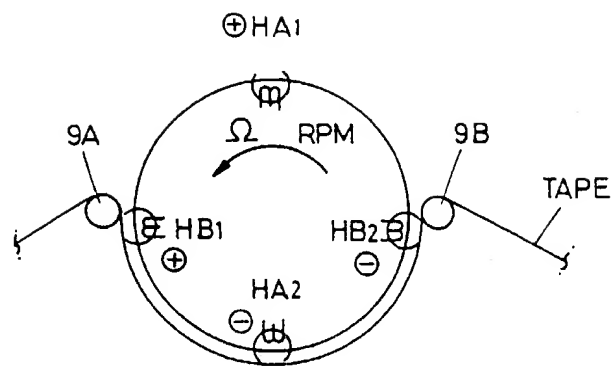


FIG. 2

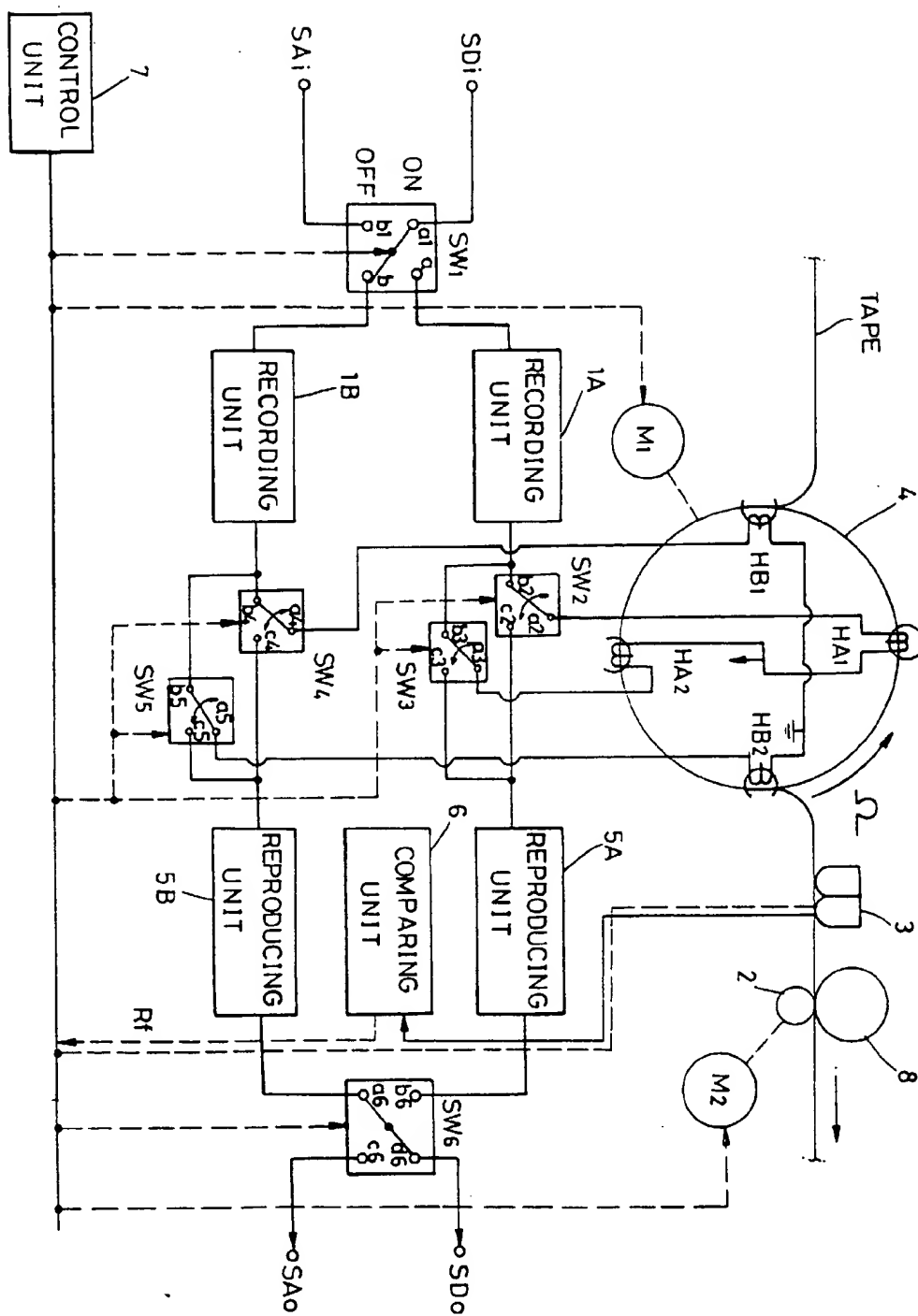


FIG. 3A

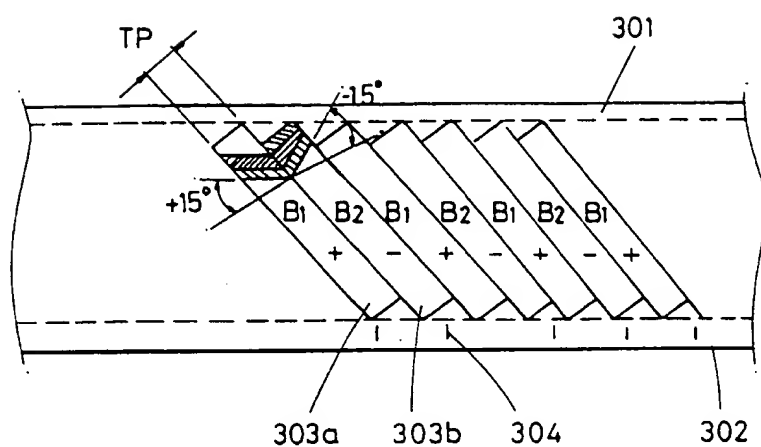
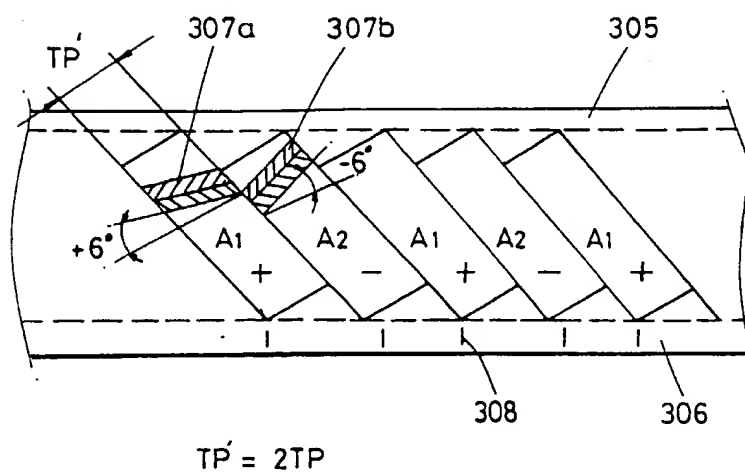
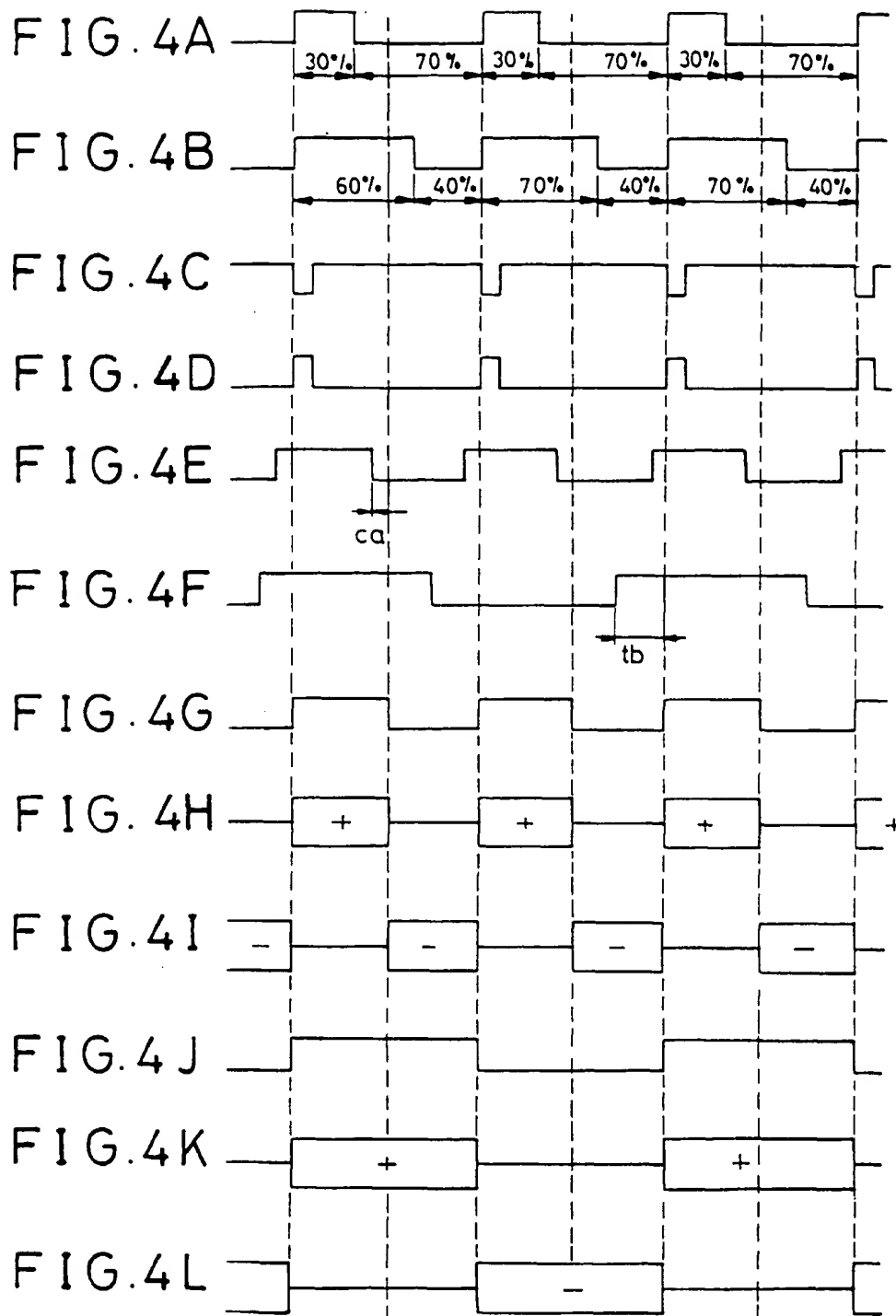


FIG. 3B





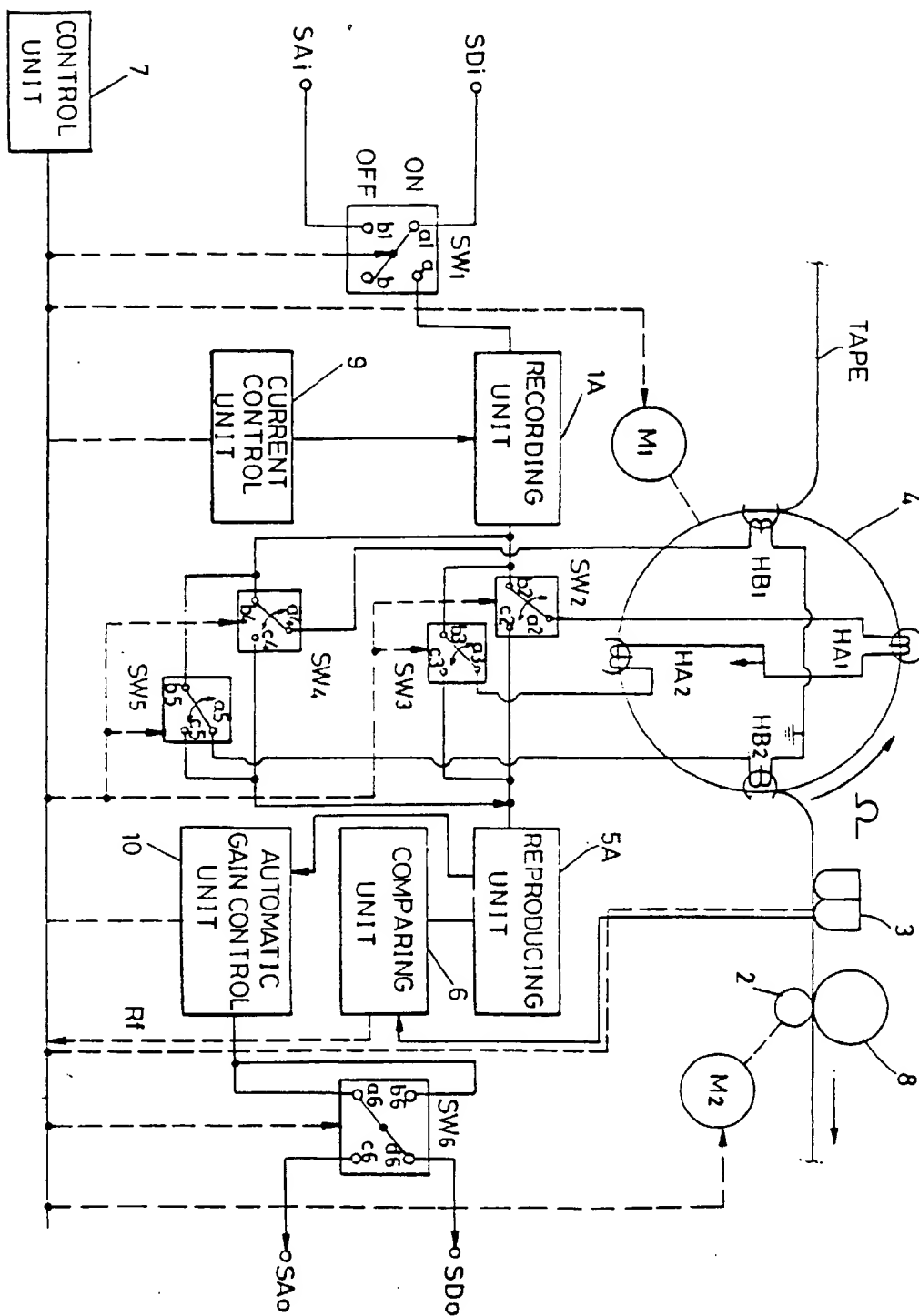


FIG. 5